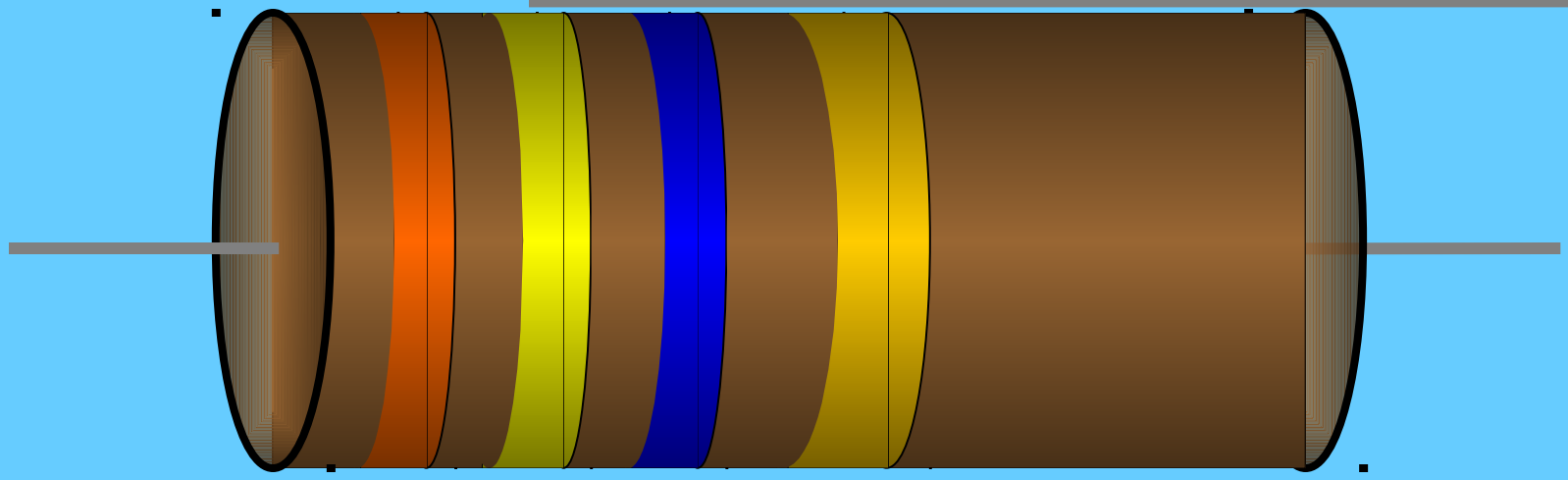
RESISTOR COLOR CODE

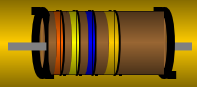
Unclassified

2 Hour Conference w/ 1Hour P/E

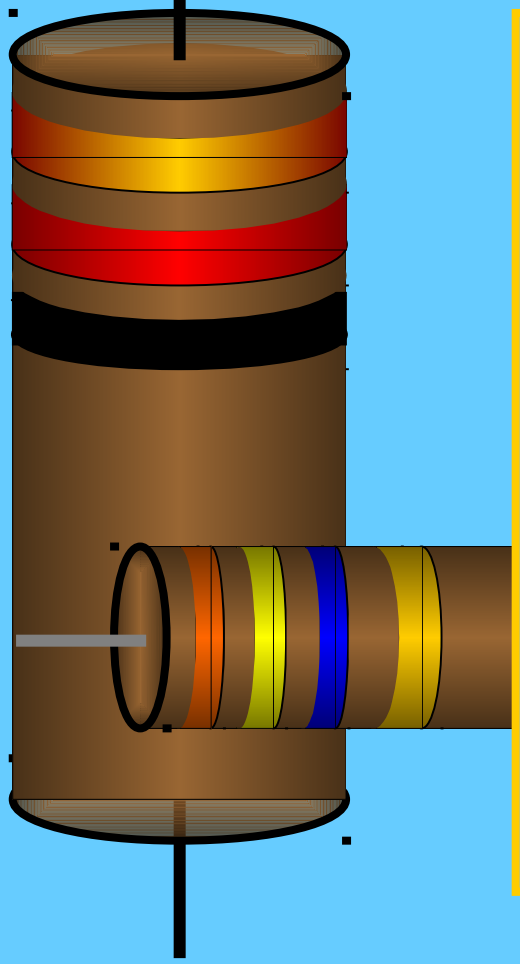
Safety & Environmental Impact “LOW”



DC: Resistor Color Code



Terminal Learning Objective { TLO }



ACTION:

Convert resistor color code & letters to a numerical value in ohms using prefix values.

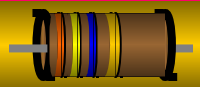
CONDITION:

Given a classroom environment, resistor color code reference chart, calculator, and official OMEMS reference materials.

STANDARD:

Be able to determine the different types of resistors, convert resistor color code to a numerical notation and/or prefix value, determine the upper and lower limits of resistance based upon tolerance value, and correctly calculate a resistors numerical value in Ohms using the resistor color code chart to the established standard of 7 correct answers out of 10 & 8 out of 10 for EOD.

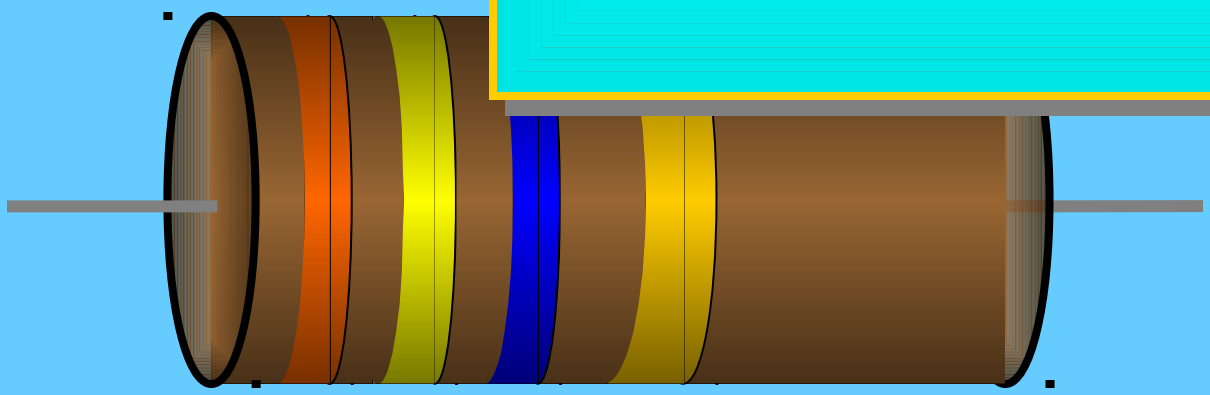
DC: Resistor Color Code



Introduction

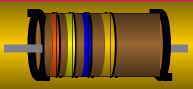
The technician needs to be able to determine the value of a resistor from its color code.

Manufacturers use this system to ID the value of resistors, and this standard is recognized throughout the world among all associated professionals in any field of electronics.



Resistor Symbols

DC: Resistor Color Code; RESISTANCE



RESISTANCE: Is the opposition to the flow of current.

Resistance controls the flow of current.

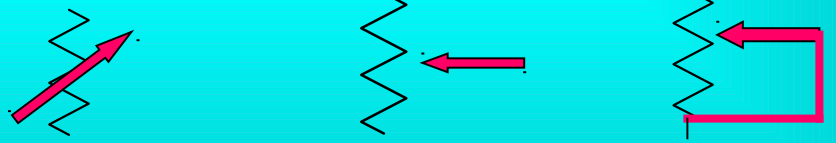
SYMBOL: R

Unit of Measure: Ohms, Ω

2 Major Types of Resistors:

1. Fixed Value:

2. Variable:

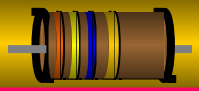


Common symbol Rheostat

Potentiometer

Fixed

DC: Resistor Color Code; RESISTORS

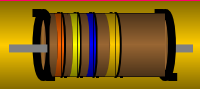


FIXED VALUE:

1. **Carbon Composition.**
   - A. **4 Color Bands, The most common**
2. **Film. Mylar & Metal Film, 5 Color Bands**
   - A. **Small in Value & Size**
   - B. **Precision applications**
3. **Wire Wound.**
   - A. **Power & Precision Applications**
   - B. **Printed Value stamped on**
   - C. **Color Coded, 1st Band is twice as wide**

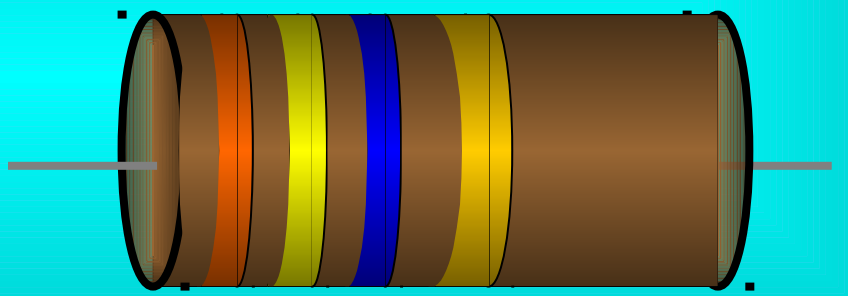
Bands

DC: Resistor Color Code



Each Color Band on the resistor equates to a number that defines the value in Ohms and the % of tolerance.

Read; Left to Right, Starting w/ the Band closest to the Edge.



0	1	2	3	4	5	6			8	9
Black	Brown	Red	Orange	Yellow	Green	Blue	Viol		ray	White
	Gold									

Reference; Official OMEMS Salmon color Training Aid.

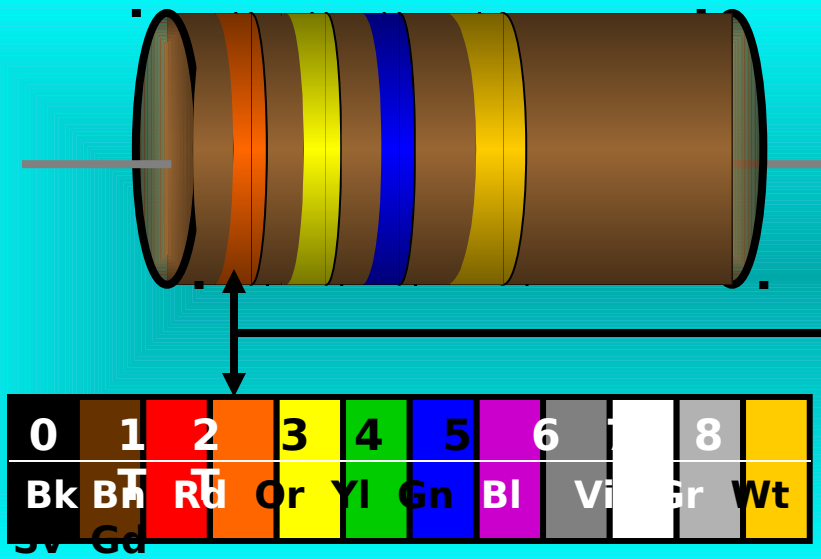
1st Band

DC: Resistor Color Code; 4 Color Bands, 1st B

1ST BAND:

1st Significant Digit. { Wire Wound, twice as wide}

"NEVER", Black, Gold, or Silver.



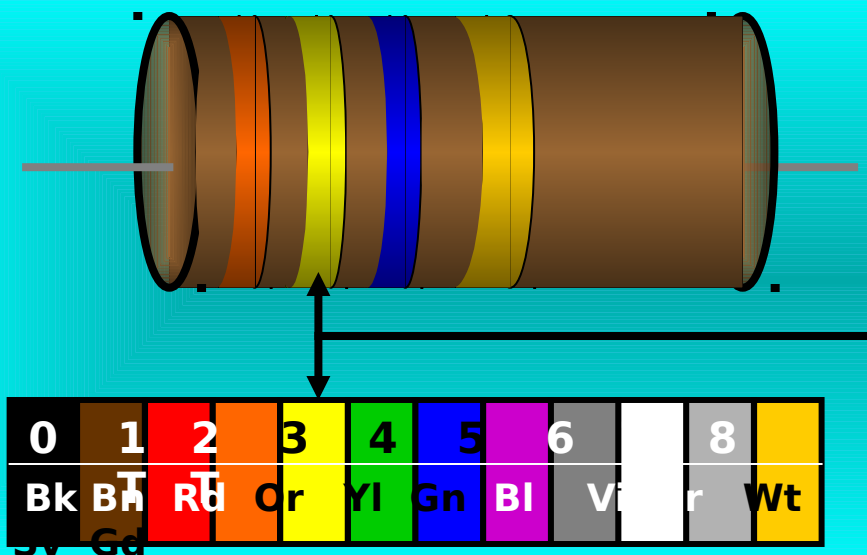
2nd Band

DC: Resistor Color Code; 4 Color Bands, 2nd Band

2ND BAND:

2nd Significant Digit.

"NEVER", Gold or Silver.



1st Digit,

= 3

2nd Digit,

Yellow

= 4

3rd Band

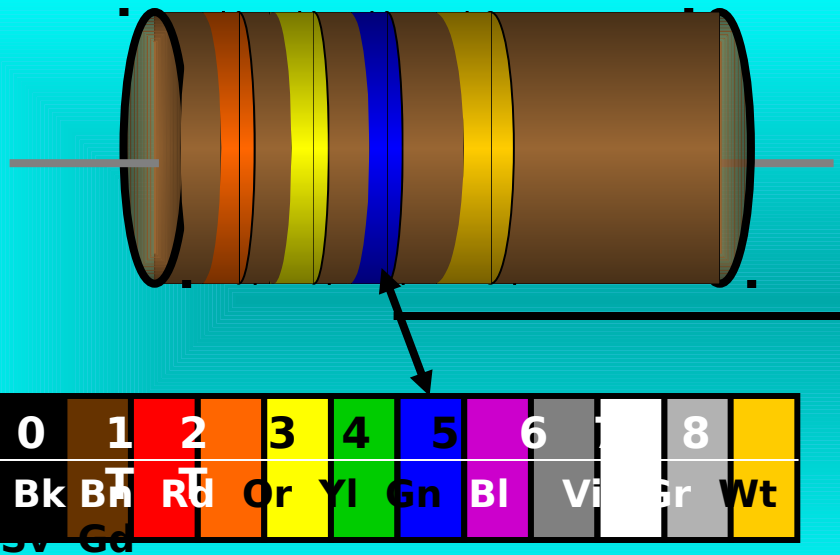
DC: Resistor Color Code; 4 Color Bands, Multiplier

3RD BAND: Multiplier Band.

The color represents the power of 10 exponent [X10#]
or

The No. of Zeros added to the 1st & 2nd Digits.

NOTE: Black = NO zeros added, Brown = 1 Zero added.



1st 2nd Multiplier

3 4 000000. Ω

34M Ω

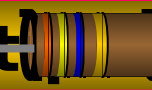
3rd, Multiplier, Blue

= X10⁶ or

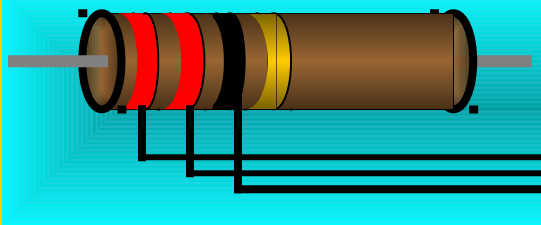
000000.

3rd Band

DC: Resistor Color Code; 4 Color Bands, Multiplier



0	1	2	3	4	5	6		8	9
Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Gray	White
	Gold								



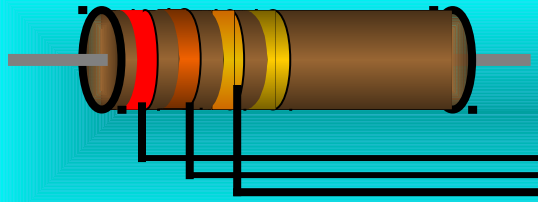
2 2 X10⁰ = 22. Ω

Rd Rd Black

BLACK

Multiplier Band

NO Zeros



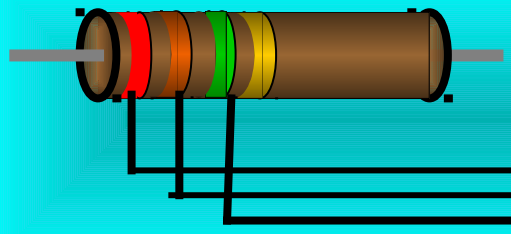
2 3 X10¹ = 230. Ω

Rd Or Brown

BROWN

Multiplier Band

1 Zero



2 3 X10⁵ = 2300000. Ω

Rd Or Green

2.3 M Ω

GREEN

Multiplier Band

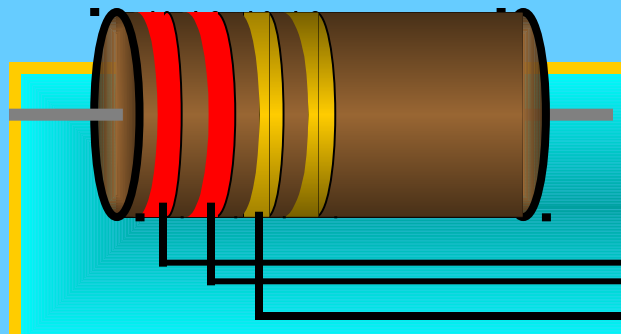
5 Zeros

3rd Gold & Silver

DC: Resistor Color Code; 4 Color Bands, Multi

0	1	2	3	4	5	6			8	9
Black	Brown	Red	Orange	Yellow	Green	Blue	Violet		Gray	White
	Gold									

3rd Band Multiplier

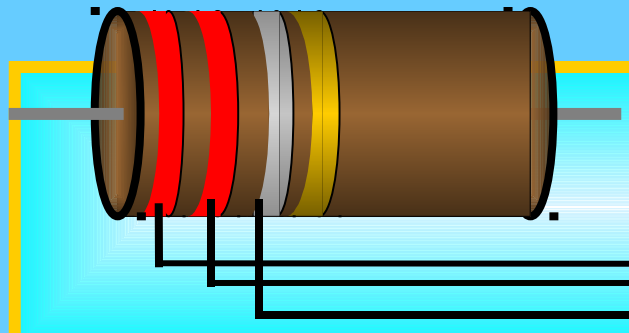


2 2 x .1 = 2.2 Ω

Rd Rd GOLD

Gold Multiplier Band

Multiply by .1



2 2 x .01 = .22 Ω

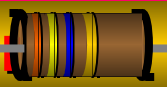
Rd Rd SILVER

SILVER Multiplier Band

Multiply by .01

4th Band

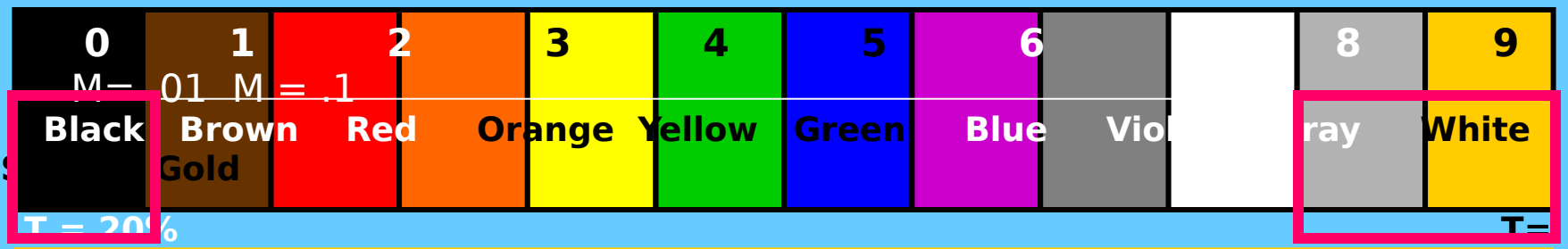
DC: Resistor Color Code; 4 Color Bands, Tolera

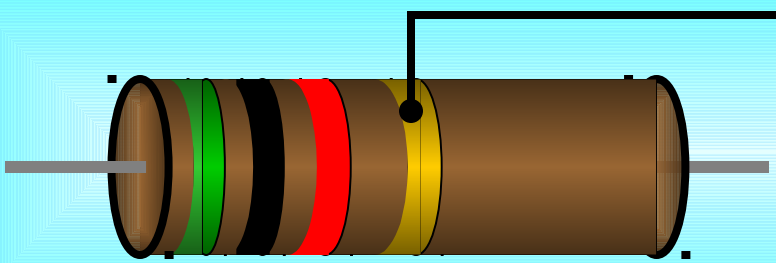


TOLERANCE BAND; **4th color band, is separated from the previous 3 bands by a wider space. Or the 4th Band may not be present.**

It defines the Upper & Lower limit values, of the previous 3 bands and is expressed as + or – %.

A Resistor found outside of the Upper or Lower limit is considered Malfunctioning.





TOLERANCE BAND:

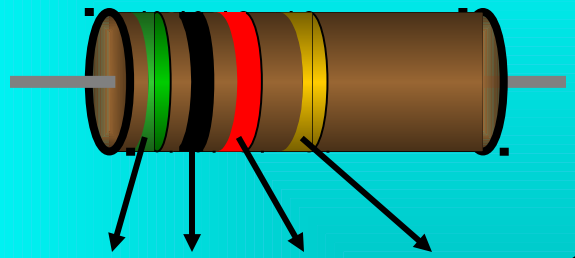
BLACK or No band = 20% = x 2

SILVER = 10% = x .1

GOLD = 5% = x .05

Tolerance

DC: Resistor Color Code; 4 Color Bands, Toleran



5 0 00 ±

5% Resistance

1

AMOUNT OF TOLERANCE:

5000.

x .05

250.00. = ± 250 Ω

Move Decimal 2 Places

2

UPPER LIMIT:

5000.

+250. Ω

5250. = 5.25 KΩ

3

LOWER LIMIT:

5000.

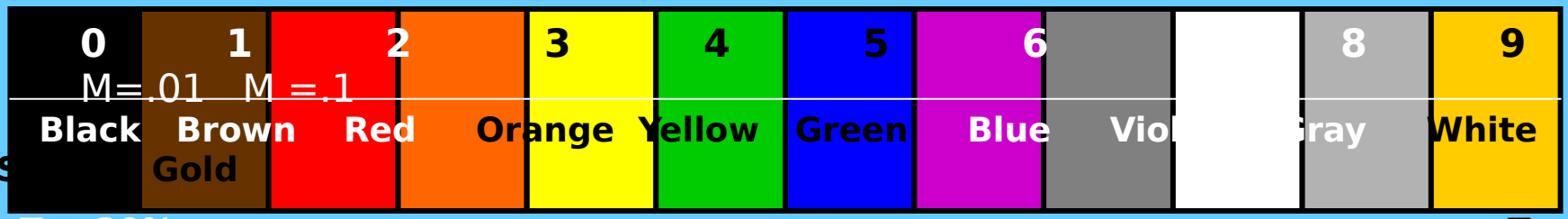
- 250. Ω

4750. = 4.75 KΩ

4

Challenge

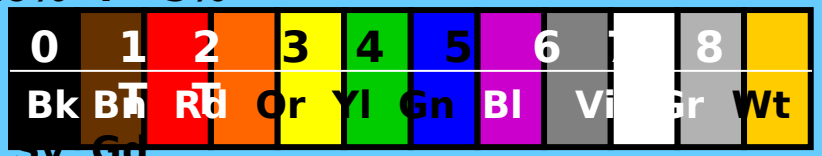
DC: Resistor Color Code; 4 Color Bands, Tolera

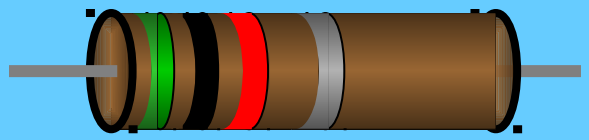


T = 20%

10% T= 5%

T=





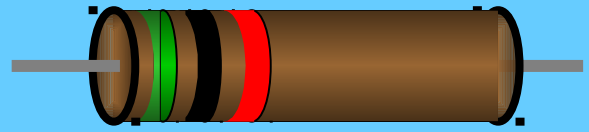
RESISTANCE: KΩ

TOLERANCE: ± %

AMOUNT OF TOLERANCE: Ω

UPPER LIMIT: KΩ

LOWER LIMIT: KΩ



RESISTANCE: KΩ

TOLERANCE: ± %

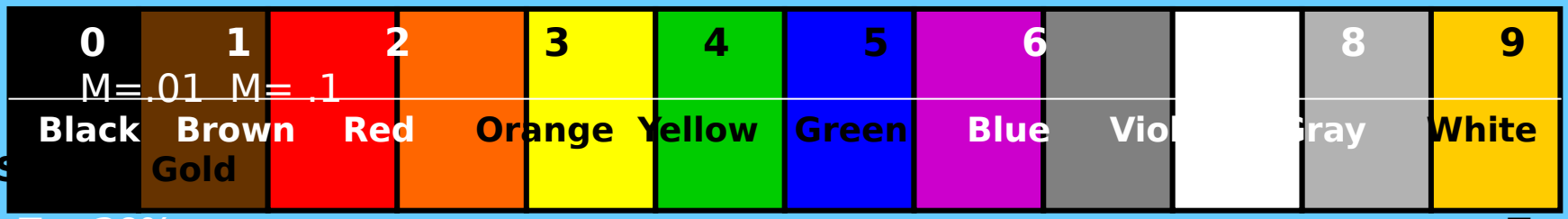
AMOUNT OF TOLERANCE: Ω

UPPER LIMIT: KΩ

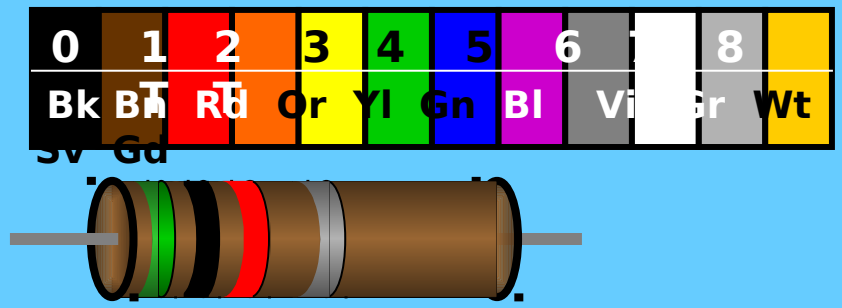
LOWER LIMIT: KΩ

Answers

DC: Resistor Color Code; 4 Color Bands, Tolera



10% T= 5%



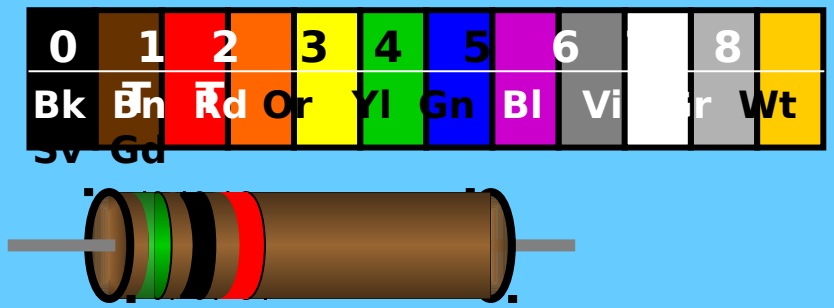
RESISTANCE: 5 KΩ

TOLERANCE: ± 10%

AMOUNT OF TOLERANCE: 500 Ω

UPPER LIMIT: 5.5 KΩ

LOWER LIMIT: 4.5 KΩ



RESISTANCE: 5 KΩ

TOLERANCE: ± 20 %

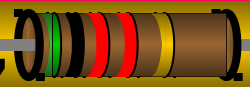
AMOUNT OF TOLERANCE 1000Ω

UPPER LIMIT: 6 KΩ

LOWER LIMIT: 4 KΩ

5 Band Resistors

DC: Resistor Color Code; 5 Color Bands,



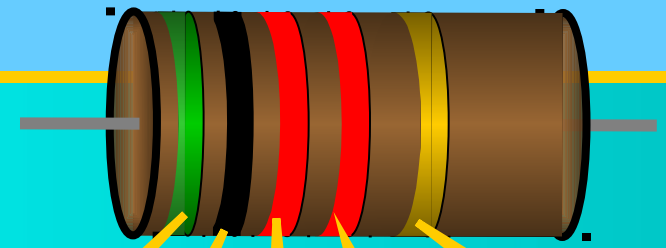
0	1	2	3	4	5	6	7	8	9
M= .01	M= .1								
Black	Brown	Red	Orange	Yellow	Green	Blue	Violet	Gray	White
	Gold								
T = 20%	T= 1%	T= 2%			T=.5	T=.25	T= .1	T=.05	
T= 10%	T= 5%								

FILM RESISTORS:

5 Color Bands

Multiplier & Tolerance are calculated like 4 Band Resistors.

Precision Applications

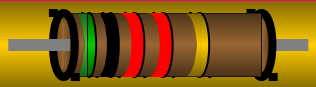


1st	2nd	3rd	Multiplier	Tolerance
5	0	2	00.	± 5%

Significant Digits

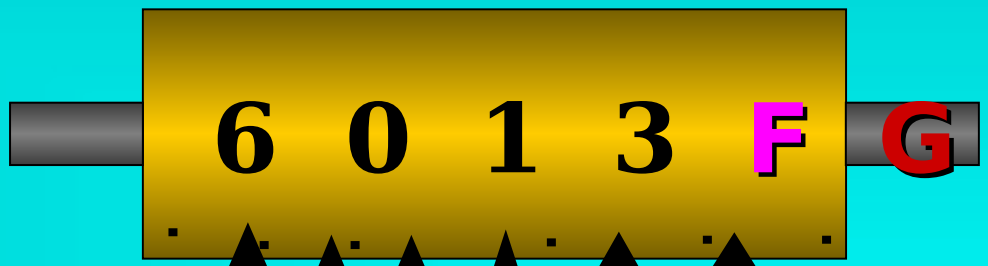
= 50.2KΩ

DC: Resistor Color Code; Film,



FILM RESISTOR; Numbers & Letters

601KΩ ±2%



1st

2nd

3rd

Significant Digits

Multiplier

Resistor type

Tolerance

REFERENCE:

Official OMEMS Salmon Color Training Aid.

Letter Tolerance:

G = ± 2% K = ± 10%

J = ± 5% M = ± 20%

Problem Sheets

DC: Resistor Color Code; Problem Sheets

JOB 1: Write in the colors or numbers in the space provided.

COLOR	NUMBER
Yellow	
Violet	
White	
Gray	
Green	
Blue	
Red	
Orange	
	0
	4
	1

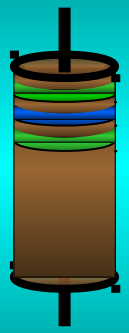
COLOR	NUMBER
	8
	6
	7
Yellow	
	3
	1
Red	
White	
	5
	0
Orange	

Bk	0
Bn	1
Rd	2
Or	3
YL	4
Gn	5
BL	6
Vi	7
Gr	8
Wt	9
Sv	T
Gd	T

Answers 1

DC: Resistor Color Code; Problem Sheets

JOB 2: Fill in the Blank With the Correct Response.



a. Each color has numerical value. On the Resistor, Green stands for number__ , Blue is for number __ and Green means that___ [how many] zeros are added. The value of the resistor is _____ or _____ .

b. The 3rd color band indicates the number of zeros at the end of the resistance value. If the 3rd band is Red,___ zeros are added .

c. A resistor has 3 yellow bands. Its value is ____ or _____ .

d. A resistor has a Violet 1st band, a White 2nd band, and a Black 3rd band. What is the resistance value? _____ .

Bk	0
Bn	1
Rd	2
Or	3
YL	4
Gn	5
BL	6
Vi	7
Gr	8
Wt	9
Sv	T
Gd	T

Answers 2

DC: Resistor Color Code; Problem Sheets

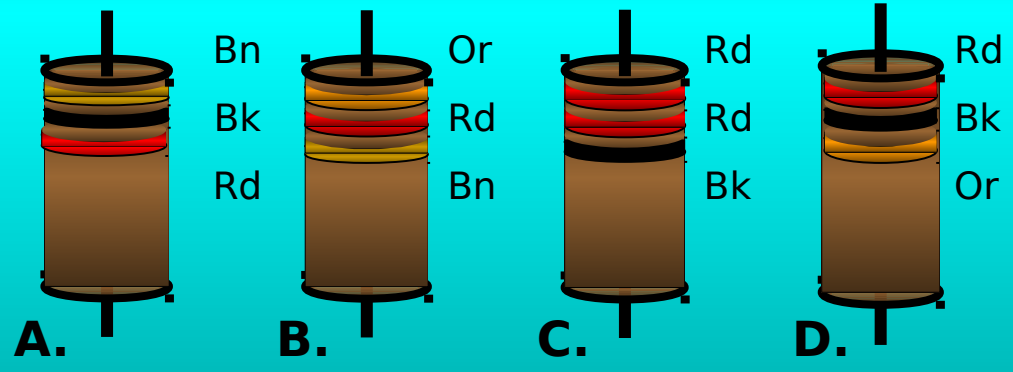
JOB 2: Fill in the Blank With the Correct Response.

e. Resistor A is ____ or ____ .

Resistor B is ____ .

Resistor C is ____

Resistor D is ____ or _____ .



Bk	0
Bn	1
Rd	2
Or	3
YL	4
Gn	5
BL	6
Vi	7
Gr	8
Wt	9
Sv	T
Gd	T

Answers 2e

DC: Resistor Color Code; Problem Sheets

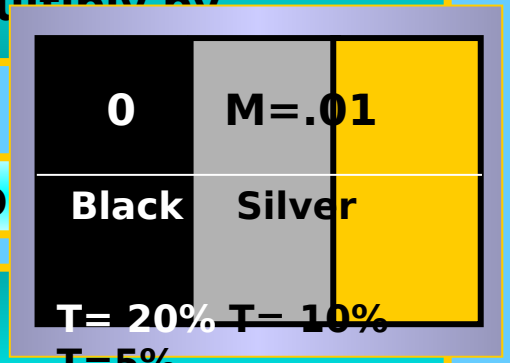
JOB 2: Fill in the Blank With the Correct Response.

f. The ___ band is the multiplier band.

g. All color coded resistors have at least ___ bands.

h. When the Multiplier band is Gold, multiply by ___ .

i. When the Multiplier band is Silver, multiply by ___ .



JOB 3: Fill in the Blank With the Correct Resp

a. The ___ band is the tolerance band.

b. When the 4th band of a resistor is Silver, its tolerance is: ___ .

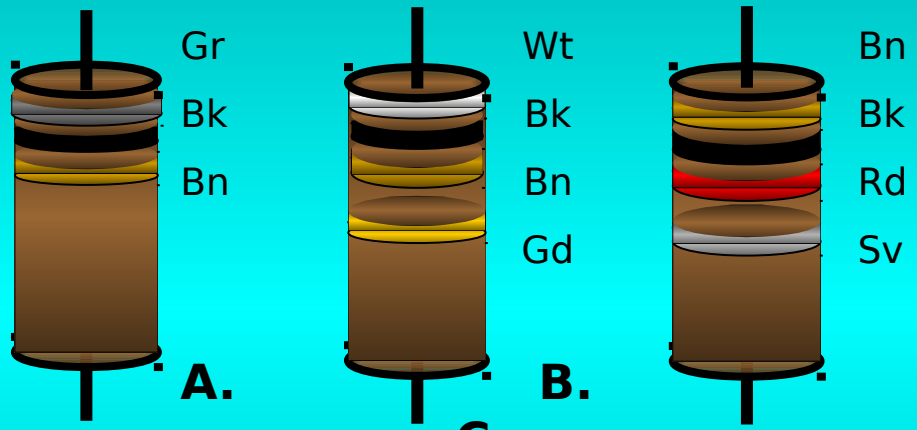
c. Look at the 4th band to find the _____ .

Answers

DC: Resistor Color Code; Problem Sheets

JOB 3: Fill in the Blank With the Correct Response.

d. Using Resistors A, B, C, Record the Value, Tolerance, and Upper & Lower Limits.



	A.	B.	C.
Value Ω			
Tolerance			
Lower Limit			
Upper Limit			

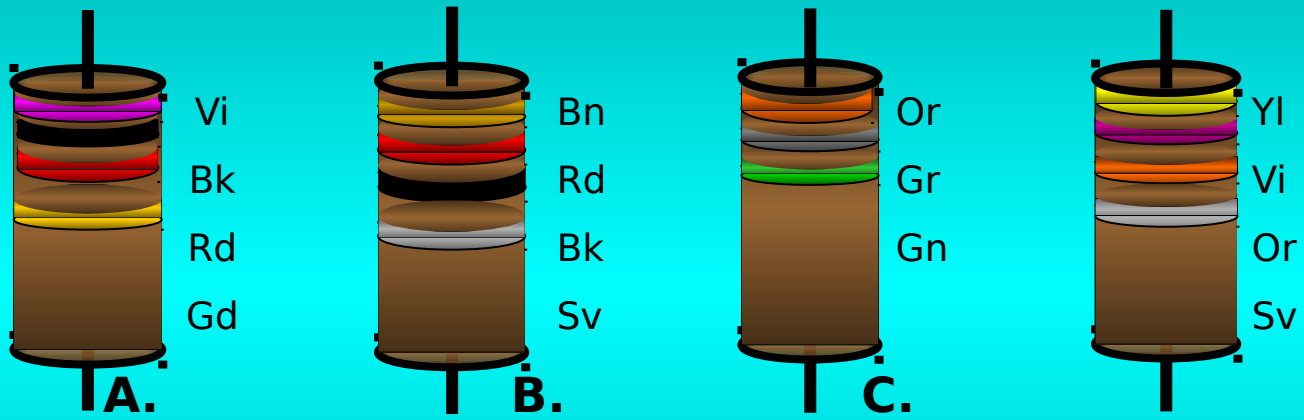
Bk	0
Bn	1
Rd	2
Or	3
YL	4
Gn	5
BL	6
Vi	7
Gr	8
Wt	9
Sv	T
Gd	T

Answers 3d

DC: Resistor Color Code; Problem Sheets

JOB 3: Fill in the Blank With the Correct Response.

e. Rate the following resistors.



Resistor Value	____	____	____	____
Tolerance	____	____	____	____

Bk	0
Bn	1
Rd	2
Or	3
YL	4
Gn	5
BL	6
Vi	7
Gr	8
Wt	9
Sv	T
Gd	T

Answer 3e

DC: Resistor Color Code; Problem Sheets

JOB 4: Determine the Resistance & Tolerance of the following.

a. 1721FJ _____ _____

b. 6404FJ _____ _____

c. 5001FG _____ _____

d. 3021FG _____ _____

e. 1002FJ _____ _____

Tolerance:

G = ± 2%

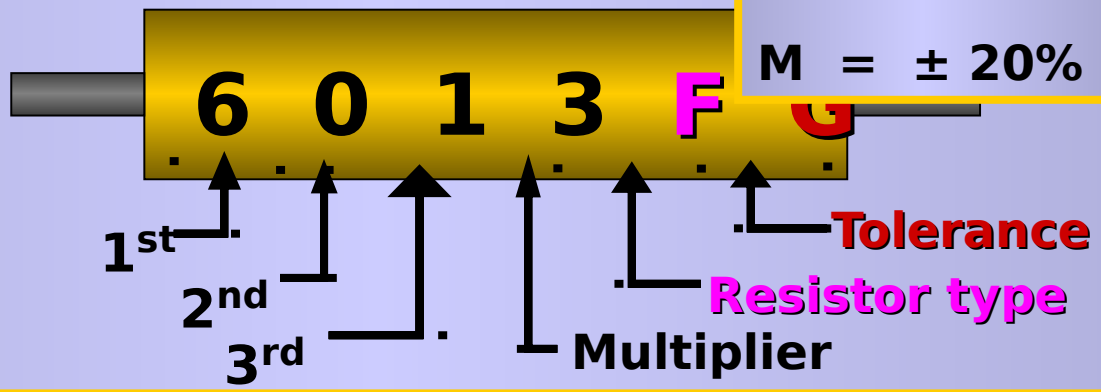
J = ± 5%

K = ± 10%

M = ± 20%

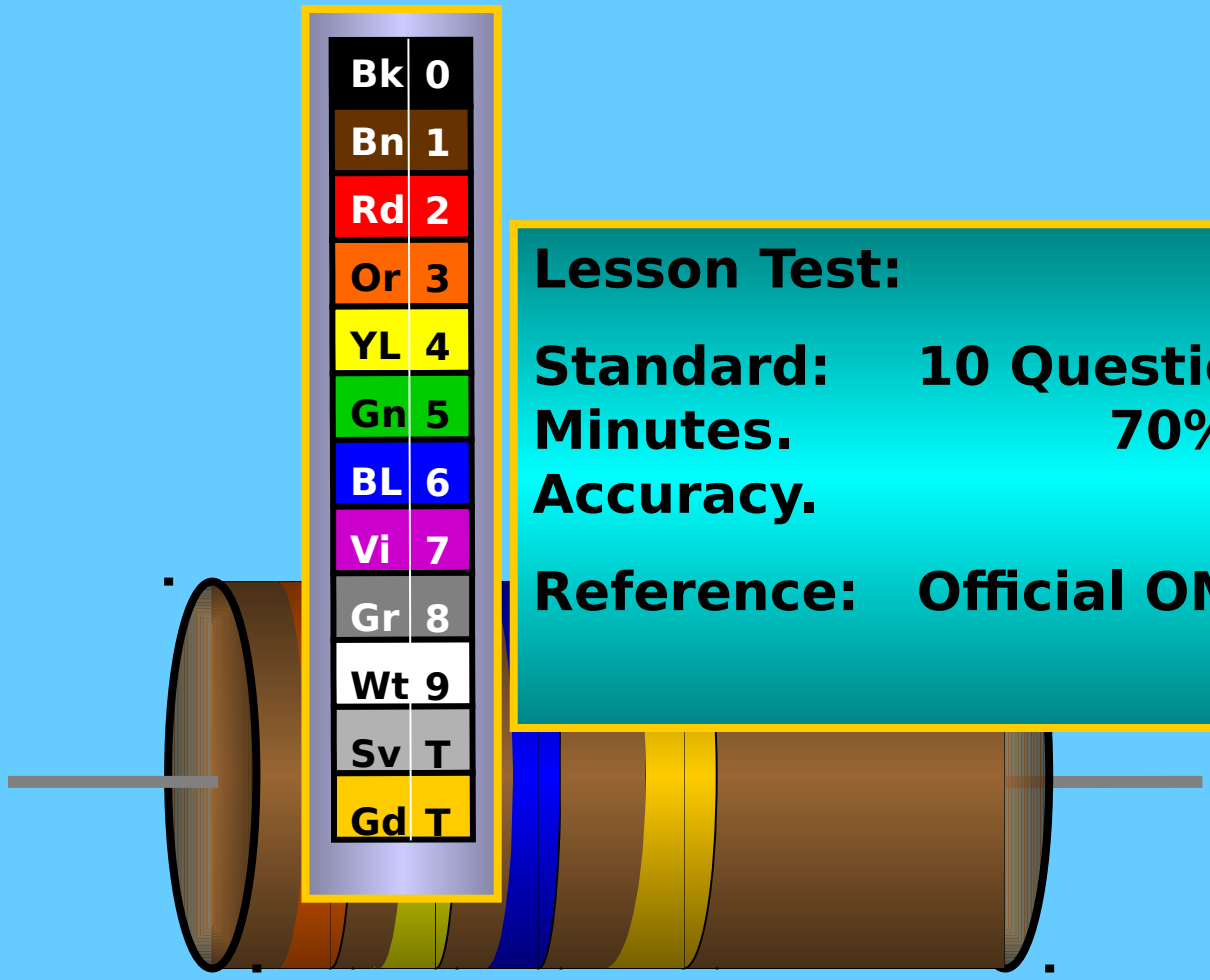
FILM RESISTOR; Numbers & Letters

601KΩ ±2%



Answers 4

DC: Resistor Color Code



Lesson Test:

Standard: 10 Questions W/in 20 Minutes. 70% Minimum Accuracy. 80% for EOD.

Reference: Official OMEMS Training Aids.